09-2-1

ecology and environment, inc.

CLOVERLEAF BUILDING 3, 6405 METCALF, OVERLAND PARK, KANSAS 66202, TEL. 913/432-9961

International Specialists in the Environment

MEMORANDUM

Linwood Mining / Materials
IAD980852297
1.2
E+E
12/14/89

TO: Pete Culver, RPO

THRU: Sharon Martin, AFITOM

FROM: E & E/FIT

DATE: December 14, 1989

SUBJECT: Trip Report for Follow-up Sampling at the Linwood Mining site (formerly Umthun Trucking), Buffalo, Iowa.
TDD #F-07-8809-008 PAN FIA0236SB
Site #V86 Project #001
Superfund Contact: Pete Culver
FIT Team Leader: Wesley McCall

INTRODUCTION

The Ecology and Environment, Inc. Field Investigation Team (E&E/FIT) was tasked by the Region VII U.S. Environmental Protection Agency (EPA) to conduct follow-up sampling at the Linwood Mining site in Buffalo, Iowa. This limestone mine is located approximately five miles southeast of Davenport (Figure 1).

The purpose of this follow-up sampling was to collect samples of the kiln ash being vented into the abandoned underground mine chamber, and observe site conditions to assess the potential for ground water contamination. The FIT collected two kiln ash samples, and ambient air monitoring was conducted in the underground mine chamber.

FIELD ACTIVITIES

The two additional kiln ash samples were collected on November 30, 1989, by FIT members Wesley McCall (team leader) and Ladd Hastings (safety officer). The sample series for this activity was DSX04. During a brief interview with Gaillard Krewer, Vice President of Operations, and Bob Niemala, Mine Manager, the FIT learned that the temperature in the mine chamber was as high as 160°F and that progress on removal and relocation of the kiln ash was proceeding slowly. The FIT entered the mine chamber area that had been cleared by the equipment operators in level C protection, and reconned the area using the Rad-mini, Mini-Ram, and HNu photoionizer. After this initial safety reconnaissance, one sample (001) of ash was collected from the material being dumped into the edge of the quarry pond. A second sample (002) was collected inside the mine chamber near the end of the drift being cleared by the equipment (Table 1; Figure 2).

ON-SITE OBSERVATIONS AND INTERVIEWS

During the initial interview Gaillard Krewer indicated that the temperature of the kiln ash and flue gases being vented into the mine chamber during operation of the system was 500°F to 600°F. Krewer said that the mine chamber had been cleaned up approximately five years ago and at that time the Mine Safety and Health Administration (MSHA) worked with Linwood to conduct air monitoring. Krewer said MSHA determined that simple dust masks would be sufficient respiratory protection for workers in the mine chamber. At the time of the FIT reconnaissance, workers in the mine chamber were using oxygen monitors in enclosed equipment cabs. Krewer said that Linwood had received a variance from the Iowa Department of Natural Resources (IDNR) to operate their lime kilns without the current pollution control while removal operations were under way. A copy of the Variance letter and of a previous Air Quality Compliance Inspection listing permit numbers are attached to this memorandum.

Krewer escorted the FIT to the entrance of the mine chamber, where a front-end loader was removing ash from the mine. The ash was warm and gave off clouds of steam as it was being dumped into the old quarry pit adjacent to the quarry pond. (The ambient air temperature was about 30° F.)

When workers took a break at 10:00 a.m., the FIT entered the mine chamber to conduct initial ambient air monitoring. A large fan had been placed near the entrance of the mine chamber to blow in fresh air. The FIT proceeded south about 75 feet then turned west down the drift being cleared by heavy equipment. This drift had been cleared for about 175 feet. The ceiling in the mine is 25 feet high and the ash in some areas was 15 to 18 feet deep. The ash was about 3 feet deep in the area being cleared and the ambient temperature was estimated to be 80°F to 90°F. The surface layer of the ash (1 to 2 inches) was dry and powder-like; below this layer the ash was warm and damp to the touch and displayed distinct layers on a 0.25-inch scale. The ash formed a mud-like slurry in some localized places on the mine floor.

The FIT crew observed red-hot, glowing 'coals' in the ash along the side of the drift being cleared. The coals were 6 to 8 inches below the surface of the ash and about 7 or 8 feet above the floor of the mine. Krewer and Niemala said they believed these 'coals' formed as a result of incomplete combustion of the coal as back pressure in the mine chamber increased as it filled with kiln ash. It appeared that these hot spots began to smolder as they were exposed to the air.

HNu readings near the end of the cleared portion of the drift varied between 100 ppm and 150 ppm. It is possible that the elevated temperature, high humidity, and dusty conditions in the mine interfered

with the operation of the HNu.$_3$The Mini-Ram particle counter gave readings in excess of 6.0 mg/M^3 while the FIT walked through the drift. No readings above background levels were recorded with the Rad-Mini radiation monitor.

OTHER INVESTIGATIVE TECHNIQUES

Draeger tubes were used to conduct further ambient air monitoring in the mine chamber. Previous analyses provided by Linwood Quarry revealed that the flue gases generated by the lime kilns contained up to two percent sulfur dioxide. Also, analyses previously conducted by County and State agencies on water samples from the well at Umthun Trucking indicated a low pH of 2.7. This well is cased through the mine chamber that is used for venting the kiln ash. These data suggested that ambient air analyses for sulfuric acid, sulfur dioxide, and nitrous oxides could be useful. Draeger tubes specific to these compounds were used to test the air in the mine; sulfuric acid and sulfur dioxide were negative with a detection limit of 0.5 ppm. The Draeger test for nitrous oxides indicated an ambient level of 0.5 ppm of the NO and NO2 compounds. The front-end loader had been operating about 30 minutes earlier in the area where the monitoring was conducted. Internal combustion engines are known to produce some nitrous oxides, which may have interfered with these results. It is also possible that the smoldering coals could be oxidizing some of the nitrogen in the air.

A simple pH test was conducted on the kiln ash. An eight-ounce sample jar was half filled with deionized (DI) water. The pH of the DI water was tested with pH test strips and was found to be 7.0. One tablespoon of kiln ash was stirred into the DI water and the pH again tested: The pH increased to 11.0. This procedure was repeated three times with the same results each time.

The coal-fired lime kilns are used to produce lime (calcium oxide, CaO) from the powdered limestone (calcium carbonate, $CaCO_3$) by using heat to drive off the carbon dioxide (CO_2). Analyses of ash samples collected by the FIT in May 1989 from ash piles at the Linwood Quarry revealed that the ash contained 25 to 39 percent calcium (Ca). This calcium appears to be from lime dust produced in the coal-fired kilns. Lime reacts with water to increase the pH by the following reaction:

$$CaO + H_2O = Ca^{++} + 2(OH^-).$$

The hydroxyl radical (OH^-) is the agent which causes the increased pH when the lime reacts with water.

SUMMARY

Two additional kiln ash samples were collected from Linwood Quarry. Samples were delivered to the Region VII EPA laboratory in Kansas City, Kansas, on December 4, 1989, for total metals, EP toxicity, and base-neutral-acids (BNA) analyses. The BNA fraction was requested after the FIT learned that products from the incomplete combustion of coal may be accumulating in the mine chamber. It is possible that these products contain polynuclear aromatic hydrocarbons (PAHs) and other extractable organic compounds.

Monitoring with the Mini-Ram particle counter indicated that the level of airborne particulates is high in the chamber where employees are working. The workers are supplied only with commercial dust masks for protection. Air monitoring with the HNu photoionizer also indicated elevated levels of airborne compounds. There is potential for PAH compounds to be present from the incomplete combustion of coal. These compounds are carcinogenic. The elevated temperature and especially the high ambient humidity may have caused interferences with the HNu. More specific monitoring for organic compounds, possibly with Draeger tubes, could clarify existing conditions.

Ash from the mine chamber was being dumped into the quarry pit at the edge of the quarry pond. During the Screening Site Inspection conducted by the FIT in May 1989, the pH of the water in the quarry pond was tested and found to be 9.8. The simple test conducted on the lime-laden ash suggests that dumping this material into the quarry pond could further exacerbate the existing problem. In an earlier interview Gaillard Krewer said that IDNR had expressed concern regarding potential contamination of the local ground water via this quarry pond.

Another area of concern is the ground water which is percolating or seeping into the mine chamber. The presence of this ground water is seen in the moisture contained in all but the upper surface layer of the ash, and in the muddy areas of ash found on the mine floor. The lime in the kiln ash could raise the pH of the water and possibly elevate the pH in the local ground water.

It appears that the earlier concern with low pH observed in the Umthun Trucking well may have been caused by sulfur dioxide from the coal in the flue gases. This earlier problem has apparently been overwhelmed by the presence of abundant lime which is now producing elevated pH levels.

Attachments:
- Table 1: Kiln Ash Samples
- Figure 1: Site Location Map
- Figure 2: Sample Location Map
- Variance Letter
- Air Quality Compliance Inspection

Table 1
Kiln Ash Samples
Follow-up Sampling of Linwood Mining Site
Buffalo, Iowa
E & E/FIT, December 1989
Activity Number DSX04

Sample	Description/Location
001	kiln ash; collected from material being dumped into edge of quarry pond
002	kiln ash; collected from drift inside mine chamber

Note: See Figure 2 for sample locations.

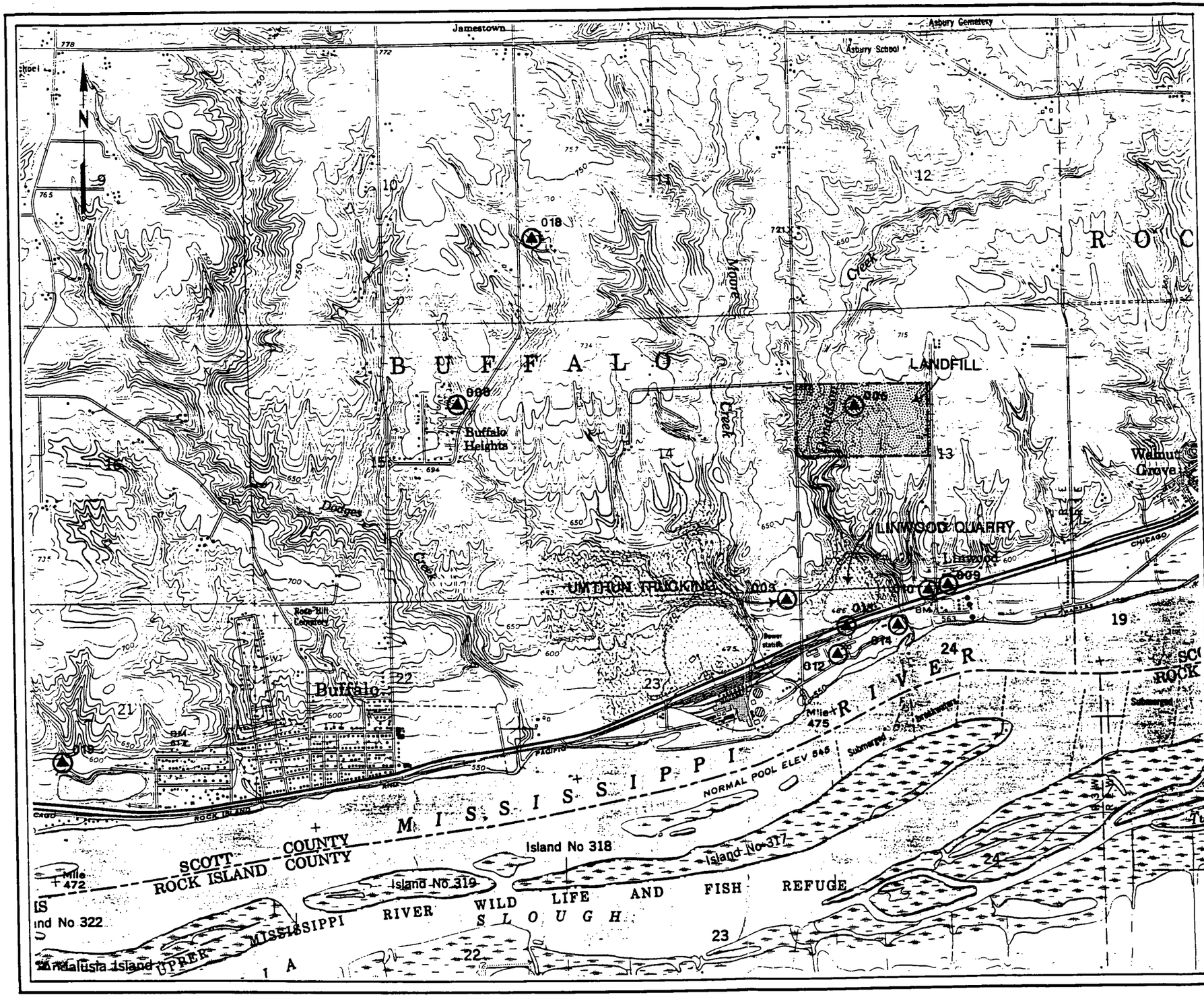
Ownership

McCarthy Improvement Co.
4321 East 60th.
Davenport, Iowa
Telephone: 319-359-0321

Linwood Mining and Minerals
401 East Front St.
Davenport, Iowa
Telephone: 1-800-345-7294

UMTHUN TRUCKING / LINWOOD QUARRY SITE

BUFFALO, IOWA



WELL SAMPLE LOCATIONS (COLLECTED DURING SSI)

MAP LOCATION

SCALE 1:24000

0 .5 1 MILE

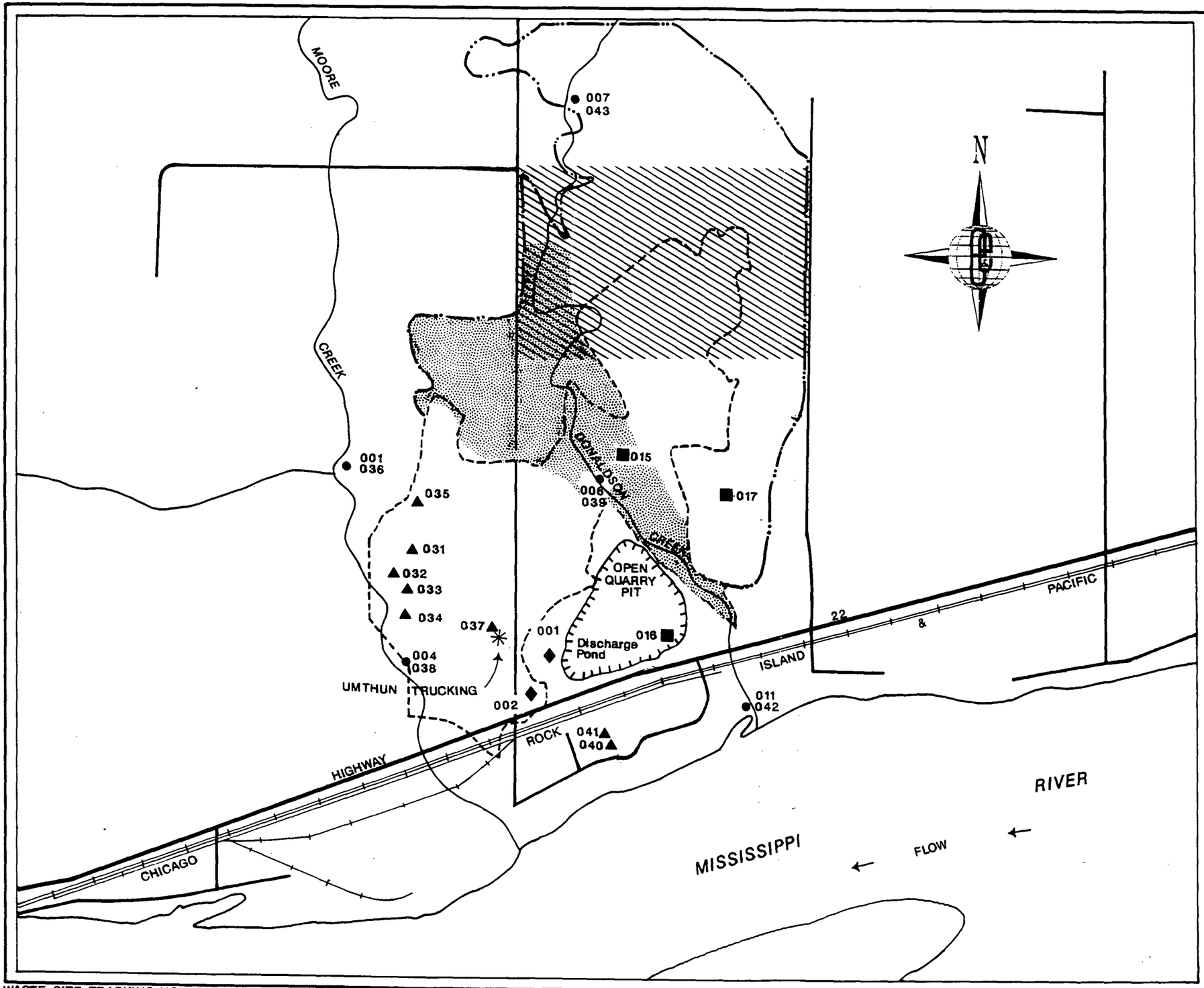
0 .5 1 KILOMETER

ecology and environment, inc.
OVERLAND PARK, KANSAS

WASTE SITE TRACKING NO.: IA0236
PREPARED BY: LEE ROBERTSON

FIGURE 1

FIT 1989
SOURCE: USGS ANDALUSIA, IA 1970 QUAD



EXPLANATION

COLLECTED DURING SSI (MAY 1989)
SAMPLE SERIES DC943

- MINE WATER SAMPLES ■
- SEDIMENT AND SURFACE WATER SAMPLES ●
- SOIL & ASH SAMPLES ▲
- SCOTT COUNTY LANDFILL
- ABANDONED QUARRY
- UPPER LEVEL ABANDONED: DAVENPORT FORMATION
- UPPER LEVEL ACTIVE: DAVENPORT FORMATION
- LOWER LEVEL: OTIS FORMATION

SAMPLES COLLECTED DURING FOLLOW-UP
(DEC. 1989)
SAMPLE SERIES DSX04

- KILN ASH ◆

LINWOOD QUARRY SITE
(Formerly Umthun Trucking)
BUFFALO, IOWA

SCALE IN FEET
0 500 1000 1500 2000

ecology and environment, inc.
OVERLAND PARK KANSAS

FIT DECEMBER 1989

WASTE SITE TRACKING NO.: IA0236
PREPARED BY: LEE ROBERTSON

SOURCE: USGS ANDALUSIA, IA 1970 QUAD

FIGURE 2: SITE MAP WITH SAMPLE LOCATIONS

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

August 1, 1989

Gaillard D. Krewer
Linwood Mining and Minerals Corporation
4321 East 60th Street
Davenport, IA 52807

Dear Mr. Krewer:

We have reviewed your request for a variance to operate your Lime Kilns without current pollution control. The request was submitted under the date of June 19, 1989. We have also reviewed the additional information submitted under the date of July 20, 1989.

It is our understanding that the Kilns will be operated in the normal mode with the gases being discharged through the mine until the increased pressure will force a shut down.

You are hereby granted a variance to operate number 1 and number 3 kilns for two weeks when not discharging the gases through the mine subject to the following conditions:

1) A Barber Greene scrubber as described in the variance application will be installed on each kiln and will be operated during the variance period.

2) Linwood shall report to the department the date the kilns begin operating under the variance mode, and the date the operation under the variance mode ends. These reports shall be made by Fax on the day the action occurs. The DNR Fax number is 515/281-8895.

3) Linwood shall provide status/progress reports on the cleaning process by Fax on Tuesday and Thursday of each week during the variance period.

4) Within 30 days Linwood shall submit a plan for operating the kilns in compliance with the standards during times when Linwood must divert the gases from the mine so that cleaning or repairs can be made.

Finally, if Linwood is unable to complete the cleaning process in the variance period we may consider, based upon available information including that in the progress reports, granting additional time not to exceed one week. If the work is not completed in that time it is our expectation that Linwood would go to a one kiln operation.

The variance is granted on the basis that emissions proposed to occur do not endanger or tend to endanger human health or safety or property, and compliance with the rules or standards from which the variance is sought will produce serious hardship without equal or greater benefits to the public.

Sincerely,

for Peter R. Hamlin
Chief
Air Quality and Solid Waste Protection Bureau

cc: LARRY Wilson, Director-DNR
Allan Stokes, DNR
Field Office 6

(Print in black ink) Page 1 of 4 FILE# 82-01-015

1. COMPANY NAME LINWOOD MINING & MINERALS CORP.
2. COMPANY ADDRESS 4321 East 60th Street
3. PLANT ADDRESS Hwy 22 SW of Davenport
   Davenport, Iowa 52807
4. PLANT SIZE & REGULATIONS [XX] A1 [ ] A2 [ ] MINOR
   [XX] NSPS [ ] NESHAPS [ ] PSD [ ] SIP
5. PROCESS &/OR PRODUCT TYPE Limestone, Hydrated Lime

IOWA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
AIR QUALITY COMPLIANCE INSPECTION
FIELD OFFICE # 6
Main operating hrs. 7:00AM-3:00PM

VISIT NO.	1	2
13. INSPECTION CODE*	2	
14. INSPECTION DATE	5/2/88	
15. TIME ARRIVE	1:30	
16. WIND SPEED & DIRECTION	S 10-20	
17. SKY CONDITIONS & TEMP.	Clr 75°	
18. INSPECTION STATUS	C	
19. TIME DEPART	3:30	
APPROVAL	XXXXXX	

6	7 SOURCE ID / SOURCE DESCRIPTION AND LOCATION	8 INSTALLATION DATE (MO/YR)	9 PERMIT #	10 APPLICABLE REGULATIONS	11 CONTROL EQUIP. CODE*	12 ALLOWABLE CAPACITY PERMIT OR STACK TEST	20 ACTUAL OPERATING CONDITIONS (PROCESS INPUT RATE) (FUEL TYPE & RATE) (STEAM LOAD)	21 IF CONTROL EQUIP. OP.	22 OPERATION SCHEDULE	23 OPACITY	24 COMPLIANCE STATUS**	25 IF COMMENTS ATT.	26 INSPECTOR INITIAL	27 DATE
	LIME PLANT DIVISION													
	3 Lime Kilns (rock feed end)	1956 62,63	73-A-219	23.3(2) a & d	0*		2 of 3 Kilns 100% capacity	✓	24hrs 7days	10	4		JP	5/2/88
	(Permit #73-A-219 requires prevention of fugitive dust generated by Linwood Stone from crossing the property line)													
	New Lime System - (System #2)		71-A-083	23.3(2) a & d	BF*		100% capacity	✓	11	0	4		JP	5/4/88
	KILN Flume Dust Storage Silo	1986	86-A-049	(offset)	BF		11	✓	11	0	4		JP	5/2/88
	3 Kiln hoods (discharge end), 3 Coolers, 2 Bins, Crusher No. 2, Screen, Hammermill, Elevator, Kiln Bldg. Nuisance Dust. Bagger	1967	NA	23.3(2)d	BF									

0* 1 Set of 4 cyclones on each kiln, then vented to abandoned mine with outlet appr. 3000 meters WSW of kilns.

BF* Mezzanine dust collector - 2nd floor of main kiln building

COMPLIANCE STATUS
0-UNKNOWN
1-NOT IN COMPLIANCE
2-IN COMPLIANCE-TEST
4-IN COMPLIANCE-INSP.
5-ON ERP SCHEDULE
6-NOT ON ERP SCHED.
9-IN COMPL.-CLOSED

CONTROL EQUIPMENT CODE
LS-LOW EFF SCRUBBER
HS-HIGH EFF SCRUBBER
BF-BAGFILTER
EP-ELECTRO. PRECIP.
CY-CYCLONE
MC-MULTICLONE
M/E-MC & EP
DF-DRY FILTER
WW-WATERWALL
M/B-MC & BF
A-AFTERBURNER
C/S-CY & SCRUBBER
O-OTHER
N-NO CONTROL

INSPECTION CODE
1-COMPLAINT INSP.
2-ROUTINE INSP.
3-STACK TEST OBS
4-OTHER-EXPLAIN

28. PERSONS CONTACTED Gaillard Krewer, Vice President Operations Phone: 800 292-1842
Dick Kroeger, Lime Plt. Mgr. Phone:
29. INSPECTORS SIGNATURE James Patton Date: 5/11/88
30. DIVISION APPROVAL BY AJ Goldsby Date: 5/17/88

APPENDIX B
Sample Unfilmed Document Target

UNFILMED DOCUMENT

THE FOLLOWING DOCUMENT THAT OCCUPIED THIS POSITION IN THE ADMINISTRATIVE RECORD WAS NOT FILMED BECAUSE:

[ ] IT IS OF SUBSTANDARD QUALITY AND WOULD NOT HAVE PRODUCED A LEGIBLE IMAGE

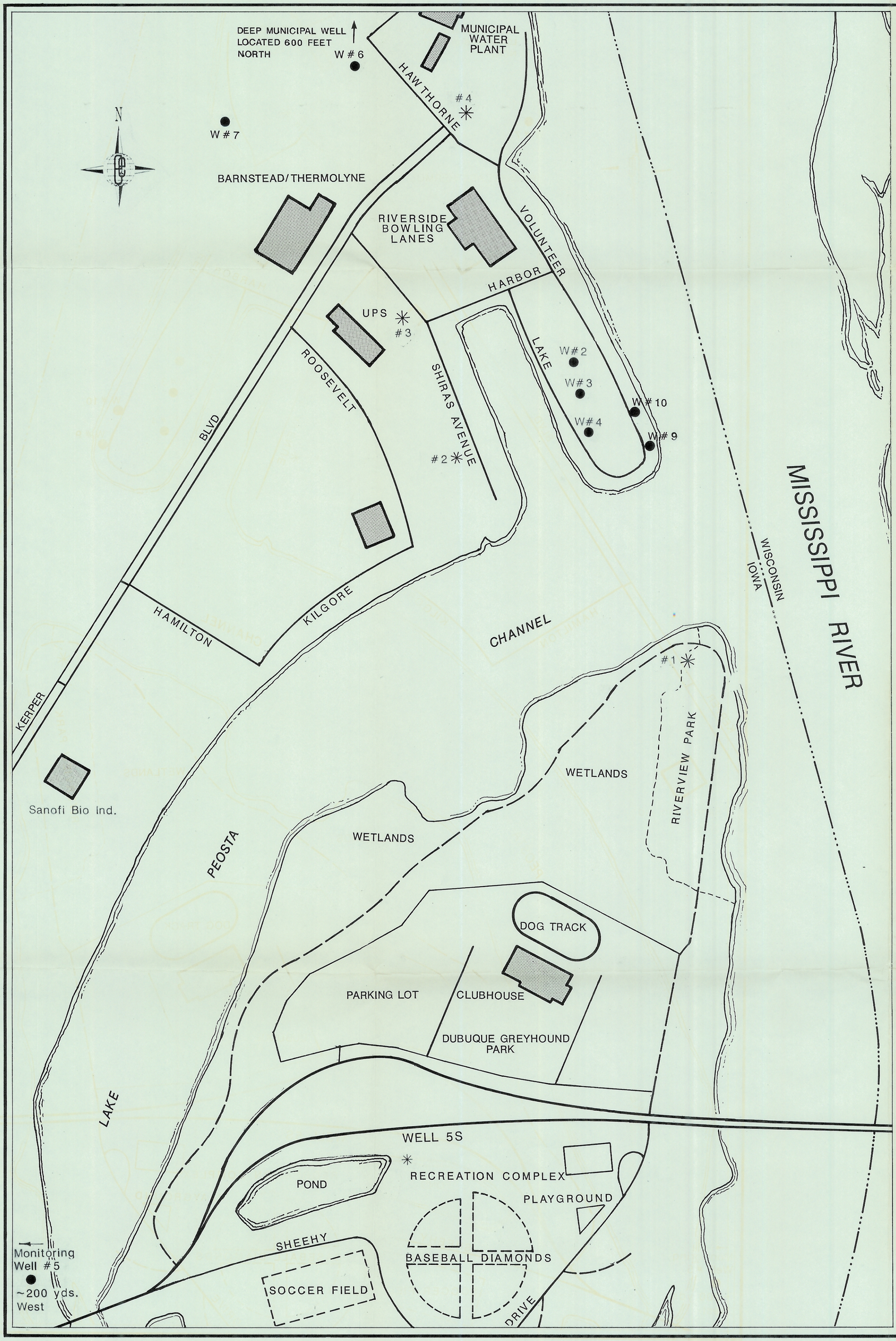
[4] IT IS AN OVERSIZE DOCUMENT THAT WOULD HAVE REQUIRED FILMING IN MORE THAN TWO OVERLAPPING SECTIONS

[ ] IT IS A PHOTOGRAPH OR A DOCUMENT CONTAINING COLORS THAT WOULD NOT HAVE PRODUCED A LEGIBLE IMAGE

DOCUMENT TITLE: map

NUMBER OF PAGES: 1

THIS DOCUMENT IS ON FILE AT THE EPA RECORDS CENTER AND MAY BE EXAMINED UPON REQUEST



FORMER DUBUQUE MUNICIPAL LANDFILL DUBUQUE, IOWA

LEGEND

✳ Well Nest Location

W#1 ● Municipal Well and Well Number

Prepared by Lori Zimpfer

Ecology & Environment/FIT March 1991

Waste Site Tracking No.: IA0235

0 1000

scale feet

ecology and environment, inc.
OVERLAND PARK, KANSAS

Figure 2: MONITORING WELL LOCATIONS